

**Patent claims**

1. A method for monitoring the operating condition of a press, particularly a packing press (1), for the production of pressed objects, preferably packs made from waste material, in particular from scrap and sheet metal wastes, comprising
- at least one step which can be registered by measurement in terms of time and/or distance for compacting the material put in in a press case (2.2)
  - a step which can be registered by measurement in terms of time and/or distance for ejecting the finished pack or pressed object,
  - and a controller (16.2) for carrying out these steps by means of a drive system (9.1) producing a hydraulic pressure, and
  - registration of amplitudes of the oscillation condition of the press and predefinition of at least one permissible oscillation amplitude as a reference value for the controller (16.2) of the press (1), **characterized by**
    - a) registration of the amplitudes of oscillations during the time or a distance of a relative movement taking place between at least one compactor (3.1, 3.2, 3.3) and/or machine element such as a door (5.1) and the press case (2.2) in the cycle from the start until the end of the pressing operation, and also ejection of the pressed object and predefinition of a

- 11 -

permissible oscillation amplitude of the entire press within the controller as a "normal condition" for time or distance increments of the relative movements,

5

b) generation of an "alarm value" with a magnitude which is above the maximum value in the "normal condition", and generation of a "shut-off value" with a magnitude which is above the "alarm value",

10

c) entry of both limiting values from "alarm value" and "shut-off value" for each relevant relative movement or for each time or distance increment of the relative movement into the controller of the press (1) and

15

d) operation of the press by means of the controller (16.2) with indication of a signal when the "alarm value" is reached and/or the "shut-off value" is reached during the cycle from the start until the end of the pressing operation or the relevant relative movement.

20

25 2. The method as claimed in claim 1, characterized in that the "alarm value" to be generated lies below the value of the amplitude which causes the stick-slip effect triggering fretting of the machine parts involved in the relative movement, so that no alarm is reported during fault-free operation.

30

3. The method as claimed in claim 1, characterized in that the "shut-off value" to be generated lies below the value of the amplitude which causes the stick-slip effect triggering fretting of the machine parts involved in the relative movement.

35

4. The method as claimed in claim 1, characterized in that the amplitudes of the oscillations within the cycle of a relative movement of the machine parts involved in the pressing and ejection operation are registered while excluding non-critical oscillation amplitudes of other machine parts, and after that the values "normal condition", "alarm value" and "shut-off value" are stored in the controller (16.2).
5. The method as claimed in one of claims 1 to 4, characterized in that the oscillation amplitudes are measured only during the movement of at least one of the piston/cylinder unit (6.1, 6.2, 6.3) acted on by a hydraulic drive system (9.1).
6. The method as claimed in one of claims 1 to 4, characterized in that when the "alarm value" and/or the "shut-off value" is reached, the operation of the press can be switched off automatically.
7. The method as claimed in one of claims 1 to 6, characterized in that the oscillation amplitudes are measured by means of a sensor (2.4) fixed to an exposed point of the press case (2.2).
8. The method as claimed in one of claims 1 to 7, characterized by the use of an integrated program for the controller (16.2) of the press, the program comprising the steps of
- a) a learning phase with recording of the maximum oscillation amplitude during the various

- 13 -

relative movements belonging to the pressing cycle or the relative movement increments,

5 b) automatic generation of alarm and shut-off values,

10 c) an active phase with registration of the measured values of the oscillation amplitudes during the pressing operation and continuous comparison with the respective alarm and shut-off values belonging to the distance or time increment and

15 automatic triggering of appropriate actions if alarm and shut-off values are exceeded.

9. The method as claimed in one of claims 1 to 8, characterized in that the "alarm value" is set to be an order of magnitude around 20% higher than the maximum measured value of the oscillations in the "normal condition", and the "shut-off value" is set to be an order of magnitude around 40% higher than the measured value of the oscillations in the "normal condition", and are entered into the program for the control of the press (16.2).

10. An arrangement for monitoring the operating condition of presses in order to carry out the method as claimed in claim 1 to 9, comprising

30

- the controller (16.2),

35 - at least one sensor (2.4) fitted to an exposed point of the press case (2.2) for measuring the oscillation amplitudes,

- 14 -

- a measuring line (16.3) for passing on the measured values with a coupler as charge amplifier (16.1), and
  - 5       - a connecting cable.
11. The arrangement as claimed in claim 10, characterized in that the sensor (2.4) is fitted to an end of the press case (2.2).
- 10
12. The arrangement as claimed in claim 10, characterized in that the values "normal condition", "alarm value" and "shut-off value" can be indicated on a monitor of an operator guidance
- 15       system in the controller (16.2) of the packing press.